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Featured Article

Motivations and impact of international rotations in low- and middle-income countries for orthopaedic surgery residents: Are we on the same page?

Heather J. Roberts [a], Patrick D. Albright [a, b], David W. Shearer [a], Nae Won [a], Madeline C. MacKechnie [a], R. Richard Coughlin [a], Theodore Miclau III [a], Saam Morshed [a], Sanjeev Sabharwal [a, *], the COACT Resident Rotation Study Group

[a] University of California, Department of Orthopaedic Surgery, 500 Parnassus Ave MU320-W, San Francisco, CA, USA, 94143
[b] University of Minnesota Medical School, Department of Orthopedic Surgery, 2512 S 7th St, Suite R200, Minneapolis, MN, USA, 55455

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ABSTRACT

Background: Despite interest among North American orthopaedic residents to pursue rotations in resource-limited settings, little is known regarding resident motivations and impact on host surgeons.
Methods: Surveys were distributed to North American orthopaedic surgeons and trainees who participated in international rotations during residency to assess motivations for participation and to orthopaedic surgeons at partnering low- and middle-income country (LMIC) institutions to assess impact of visiting trainees.
Results: Responses were received from 136 North American resident rotators and 51 LMIC host surgeons and trainees. North American respondents were motivated by a desire to increase surgical capacity at the LMIC while host surgeons reported a greater impact from learning from residents than on surgical capacity. Negative aspects reported by hosts included selfishness, lack of reciprocity, racial discrimination, competition for surgical experience, and resource burdens.
Conclusions: The motivations and impact of orthopaedic resident rotations in LMICs need to be aligned. Host perceptions and bidirectional educational exchange should be incorporated into partnership guidelines.

Introduction

Interest among North American residents for clinical experiences in low- and middle-income countries (LMICs) is growing. In a survey of resident members of the American College of Surgeons, 92% of respondents demonstrated interest in an international elective, and 82% would prioritize an international elective over some or all other clinical opportunities.[1] As of 2015, over one quarter of North American orthopaedic residency programs offered international elective training opportunities.[2,3] Studies have demonstrated a positive influence of international rotations on visiting North American residents, such as exposure to unique pathology, appreciation for innovative solutions to resource limitations, and hands-on experience.[4,5]

The impact of visiting resident rotations on LMIC institutions has the potential to be positive. Such rotations present an opportunity for academic exchange between partnering institutions, foster commitment to service among orthopaedic surgeons, and may help address a gap in care in LMICs.[4,6] However, concern regarding the ethics and impact of resident rotations in LMICs include visiting residents' cultural insensitivity, unawareness of impact on established systems and resources, and assumption of responsibilities above their levels of training.[7,8] Little research has been conducted to understand the impact of visiting orthopaedic resident rotations on host LMIC institutions.[9]

The goal of this study is to explore North American orthopaedic resident motivations for participation in rotations in LMICs and the

* Corresponding author.
E-mail addresses: heather.roberts@ucsf.edu (H.J. Roberts), patrick.d.albright@gmail.com (P.D. Albright), david.shearer@ucsf.edu (D.W. Shearer), nae.won@ucsf.edu (N. Won), madeline.mackechnie@ucsf.edu (M.C. MacKechnie), richard.coughlin@ucsf.edu (R. Richard Coughlin), theodore.miclau@ucsf.edu (T. Miclau), saam.morshed@ucsf.edu (S. Morshed), sanjeev.sabharwal@ucsf.edu (S. Sabharwal).

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perceived impact of these rotations among host surgeons and trainees. We further sought to understand if there was concordance between North American motivations and host-perceived impact.

Methods

Survey design and distribution

Institutional review board approval was obtained from our institution (UCSF IRB 18–26835). One survey was designed for distribution to North American orthopaedic residency international rotation site directors (Appendix A). This site director survey was distributed to all North American orthopaedic residency department chairs or program directors, who were asked to either self-identify as their program's international rotation site director or to identify the individual who served as the site director at their program.

Two additional surveys were designed: one for distribution to North American orthopaedic surgeons and trainees, and one for distribution to host orthopaedic surgeons and trainees (Appendices B and C). Each survey consisted of informed consent, demographic questions, and details concerning the academic partnership. Both surveys were designed based on prior studies assessing perceptions of international orthopaedic experiences.[3,10] Inclusion criteria for North American respondents were orthopaedic surgeons, fellows, or residents who had participated as an orthopaedic resident from a North American training program in an international rotation to an LMIC, as defined by the World Bank.[11] Inclusion criteria for host respondents were orthopaedic surgeons or trainees who had been at an institution that hosted North American orthopaedic residents within the past 10 years.

The North American survey included questions based on a five-point Likert scale that assessed multiple motivations for participation in an international rotation during residency. The host survey included questions based on a five-point Likert scale that assessed the perceived impact of visiting residents in multiple domains. Both surveys included open-ended questions to query motivations, perceived impact, and overall assessment of international partnerships. Question design was based on a review of the literature and consensus among the authors. By default the survey was anonymous, but all respondents were given the opportunity to disclose their name and contact information for participation in a future qualitative study. The host survey was translated into Spanish for distribution to Spanish-speaking partners.

To reach North American respondents, the program coordinator and either the program director or department chair from each orthopaedic residency program in the United States (n = 182) and Canada (n = 17) were asked to distribute the survey to residents, faculty, and alumni. To contact host respondents, each North American residency program with partnerships in LMICs was asked to distribute the host survey to a representative at their partnering host institution. This representative was then asked to distribute the survey to all current faculty and trainees at the LMIC institution. Follow-up emails were sent at monthly intervals, and surveys were closed after three months. Responses were captured using Research Electronic Data Capture (REDCap),[12] a secure web-based data collection system.

Statistical analysis

Descriptive statistics were calculated to summarize the characteristics of site director, North American, and LMIC host respondents. Comparisons in the distribution of responses for questions using a Likert scale were performed using the Wilcoxon rank-sum test. After adjustment for multiple comparisons using a Bonferroni correction, a p-value <0.003 was considered significant. All statistical analyses were performed using Stata 13.0 software (StataCorp, College Station, Texas).

Results

Site director respondents

Responses from 26 North American site directors were received. Thirteen programs (50%) offered LMIC rotations for ≤5 years. Eighteen programs (69%) offered LMIC rotations that are two weeks or shorter. Ten programs (38%) worked with partner host institutions that did not have local orthopaedic residents. Fewer than half of programs (42%) had formal learning objectives for residents during their rotation. While fifteen programs (58%) had a formal system for residents to provide feedback about the LMIC rotation, only six programs (23%) had a formal system for host partners to provide feedback about visiting residents (Table 1). Five programs (10%) did not provide support, such as financial assistance, supplies or equipment, administrative support, academic resources, or language services, to their partner host institution.

North American resident rotator respondents

A total of 156 North American responses were received. Nine duplicate responses were excluded. Duplicate responses were identified by repeated name and/or email address, which were optional fields, and/or verbatim repeated free text fields. The latest submission was retained for analyses. Eleven responses were excluded because the international rotation occurred at a time other than during orthopaedic residency. The remaining 136 responses were included in the analyses.

The majority of North American respondents were male (82%) and age 25–44 (84%). The majority of respondents' level of training at the time of their international rotation was from post-graduate year (PGY)-3 to PGY-5. One quarter of respondents arranged their own international rotation, and 42% had a formal residency rotation through which their international rotation was arranged (Table 2). The most common locations of international rotations were in Latin America (n = 67) and sub-Saharan Africa (n = 50) (Fig. 1).

Table 1
Characteristics of North American rotations.

Length of time program has offered LMIC rotation	Number (%)
<3 years	5 (19)
3–5 years	8 (31)
6–10 years	5 (19)
>10 years	8 (31)
Typical duration of LMIC rotation	
1 week	9 (35)
2 weeks	9 (35)
4 weeks	6 (23)
>4 weeks	2 (7)
Presence of local orthopaedic trainees at LMIC host institution	
Yes	16 (62)
No	10 (38)
Presence of form al resident learning objectives for rotation	
Yes	11 (42)
No	15 (58)
Presence of formal feedback for residents about LMIC rotation	
Yes	15 (58)
No	9 (35)
Unsure	2 (8)
Presence of formal feedback for host institutions about visiting residents	
Yes	6 (23)
No	16 (62)
Unsure	4 (15)

Table 2
Characteristics of respondents.

Gender	North American (n = 136)	Host (n = 51)
	Number (%)	
Female	25 (18)	3 (6)
Male	111 (82)	48 (94)
Current age		
25–34	65 (48)	23 (45)
35–44	49 (36)	23 (45)
45–54	15 (11)	3 (6)
55+	7 (5)	2 (4)
Current level of training or practice		
Trainee	69 (51)	30 (59)
Faculty	67 (49)	21 (41)
Level of training at time of LMIC rotation		
PGY 1	7 (5)	
PGY 2	8 (6)	
PGY 3	26 (20)	
PGY 4	55 (43)	
PGY 5	27 (21)	
PGY 6	6 (5)	
Prior international experience		
Surgical	51 (28)	
Medical, non-surgical	46 (26)	
Non-medical	32 (18)	
No prior experience	50 (28)	
Arrangement of the rotation		
Formal residency rotation	57 (42)	
Precedent but no formal rotation	29 (21)	
Self-established	34 (25)	
Other	16 (12)	

Motivations for traveling overseas for a residency rotation were ranked from most to least influential and grouped according to self- versus host-focused incentives (Table 3). For example, living abroad was categorized as a self-focused motivation, while reducing workload for the local care team was categorized as a host-focused motivation.

Host respondents

A total of 65 host responses were received. Four responses were excluded for not having hosted a visiting resident in the past ten years. Eight duplicate responses were excluded. Two responses were excluded for not providing consent to participate. The remaining 51 responses were included for analyses.

The majority of respondents were male (94%), between the ages of 25 and 44 (90%), and current trainees (59%) (Table 2). Respondents represented 10 countries in four continents (Fig. 2). Few of the host trainees (13%) and half of host faculty (52%) had traveled to their North American partner institution's site for an observership or rotation. Of those who had not traveled, reasons included lack of invitation (58%), cost (28%), and time constraints (4%).

Concordance

A significant difference between North American motivation and perceived host impact was found for five of the 12 evaluated motivation/impact pairs (Table 4). Ratings were significantly higher among North American than host respondents for three of these pairs: exposure to unique cases ($p = 0.0023$), increasing access to surgical care at the LMIC institution ($p < 0.0001$), and transfer of surgical skill training from LMIC host to North American resident ($p = 0.0007$). As compared to North American respondents, host respondents gave significantly higher rating to transfer of orthopaedic knowledge from North American residents to LMIC hosts ($p = 0.0013$) and conducting research ($p = 0.0013$).

Among host respondents, 60% of host faculty felt that the overall impact of visiting residents is positive, compared to over 90% of host residents ($p = 0.31$). In comparison, 75% of host faculty and 90% of host trainees felt that the impact of visiting faculty was positive (Figs. 3 and 4).

Host free text analysis

Host respondents were queried regarding the perceived impact of visiting residents. Free text responses grouped into positive and negative themes are shown in Tables 5 and 6, respectively.

Discussion

This survey, which assessed North American orthopaedic residency LMIC rotation characteristics, North American orthopaedic resident motivations for LMIC rotations, and host orthopaedic surgeons' and trainees' perceived impact, is novel in its inclusion of

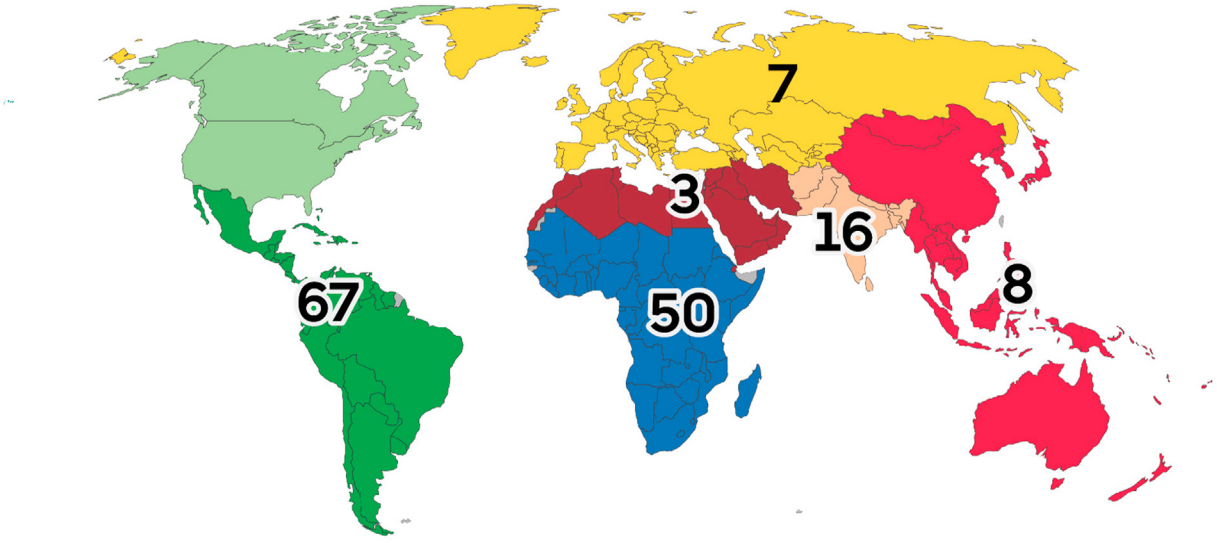

Fig. 1. Geographic distribution of North American international resident experiences.

Table 3
North American resident motivation for participation in an international rotation[a] (listed in descending order of average Likert score).

North American resident motivation for international rotation	Average Likert score (SD)
Exposure to different case mix	4.57 (0.63)
Explore global orthopaedics as component of career	4.34 (0.87)
Increase cultural competence	4.28 (0.83)
Increase local access to surgical care	4.09 (1.06)
Live abroad	4.04 (0.98)
Learn orthopaedic skills from host surgeons	3.97 (0.89)
Learn orthopaedic knowledge from host surgeons	3.89 (1.03)
Reduce workload for local care team	3.81 (1.08)
Participate in high-volume center	3.56 (1.09)
Teach orthopaedic skills to host surgeons	3.55 (1.00)
Teach orthopaedic knowledge to host surgeons	3.50 (1.08)
Increase local surgical teaching capacity (train the trainer)	3.39 (1.10)
Mentor local trainees/surgeons	3.28 (1.06)
Operative independence	3.25 (1.18)
Career advancement	3.09 (1.19)
Improve language skills	2.62 (1.23)
Research	2.44 (1.25)
Fulfill religious obligation	2.09 (1.21)

[*] Gray background denotes self-focused motivation and white background denotes host-focused motivation

both members – visitors and hosts – of this type of academic partnership. No prior study has assessed the LMIC orthopaedic hosts' perspectives in a formal survey.

Of the North American residency programs that provided characteristics of their international rotation, half had offered an international rotation for five years or fewer. This reflects that interest in international experience during residency is growing. Furthermore, it highlights the importance of developing guidelines for such rotations as more programs establish this opportunity during residency.

We found that the majority of LMIC host respondents had not participated in an observership at the North American partner site. Many hosts felt they had not had an invitation for travel to their partner's institution, which may indicate a lack of reciprocity between North American institutions and their LMIC partners. A sense of one-sided relationships was also identified in free text responses from host surgeons regarding negative impact of visiting residents. Previous surveys of host physicians have demonstrated reciprocity to be important to successful partnerships,[13] and reciprocity is a tenant of ethical practice in published guidelines for trainee global health experiences.[14–16] We recommend that North American programs identify opportunities to increase reciprocity with their partnering institutions. This may be through observerships or rotations for LMIC surgeons and trainees at partner North American institutions. In particular, leaders such as program directors from both LMICs and North America can visit each other's institution to become familiar with the environment in which North American residents are accustomed to practice and the environment they will be exposed to when going overseas, respectively. This bidirectional exchange can have the added advantage of alleviating mismatched expectations during resident rotations at the LMIC institution. Additionally, five of the 26 North American site directors reported that their program does not provide support of any kind to the host institution for hosting North American residents. This identifies an opportunity for North American programs to solicit needed areas of support from their host partners and work to meet those needs.

North American respondents were more motivated by a desire to increase local access to surgical care than to share orthopaedic knowledge with host surgeons, while host surgeons reported a greater impact from learning orthopaedic knowledge than from an impact on surgical capacity. This may reflect the transient nature of visiting resident rotations, in which surgical capacity may be influenced during the rotation but not sustained, while knowledge transfer may have more enduring effects.[17] Indeed, the vast majority of North American programs in this study offered international rotations of two weeks or shorter duration, and only two programs offered rotations longer than four weeks. Additionally, many visiting residents are not skilled enough to operate independently and therefore have limited direct effect on surgical capacity, yet because they have access to educational materials that are not available in LMICs, they are positioned to contribute more through knowledge transfer than surgical performance. Further exploration is needed to clarify these differences and understand their implications.

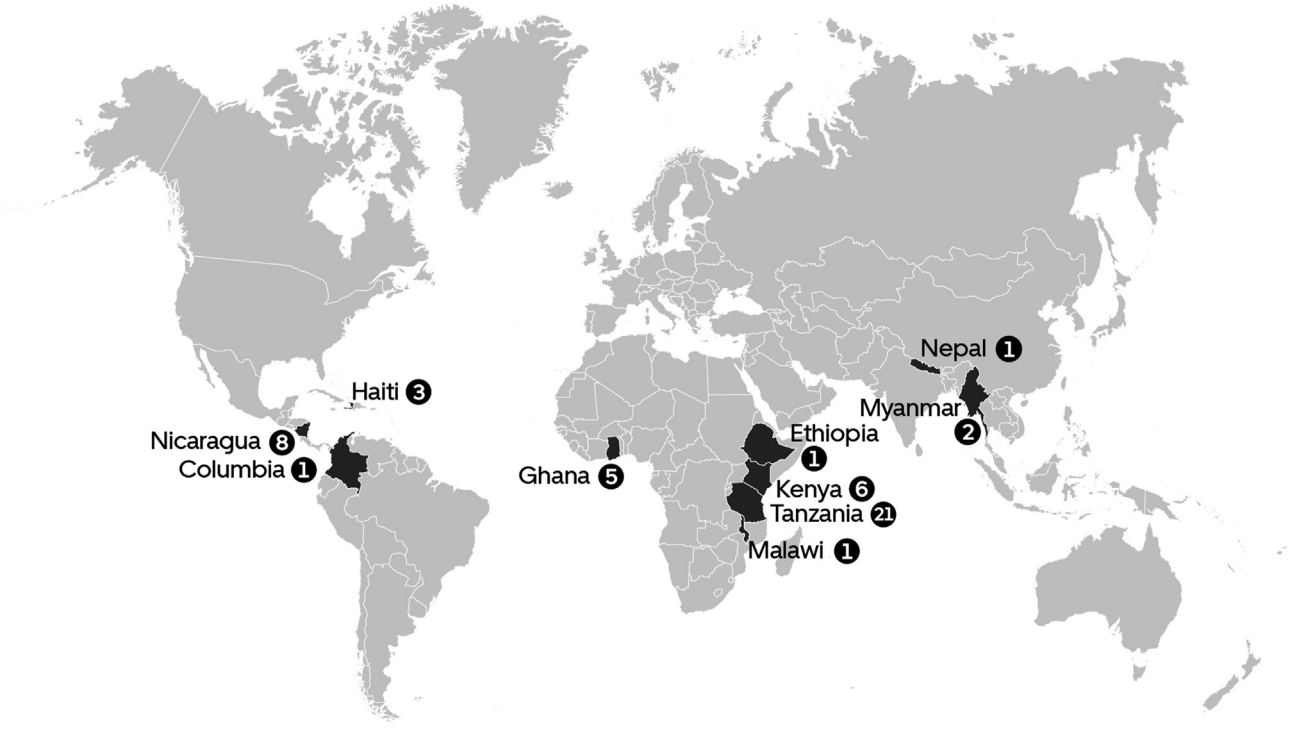

Fig. 2. Geographic distribution of host respondents.

Our findings did not support that research was either a great motivator for rotating residents or represented a significant perceived impact among host surgeons. Anecdotally, we have found research to be a stronger motivator for North American medical students and faculty working internationally for a greater length of time than for residents doing a typically shorter rotation. While host respondents rated research low among the list of possible impacts, the rating of research was significantly higher among host as compared to North American respondents, which may be because of existing research collaborations with North American medical students and faculty.

While the overall impact of visiting residents on host institutions was perceived to be positive by over 90% of host trainees, only 60% of host faculty reported the impact of visiting residents to be positive. This trend, while not statistically significant, suggests that the positive impact of visiting residents is maximized when they interact with host trainees. Over one third of North American programs with international rotations reported that their partner host institution does not have local orthopaedic trainees. Further investigation of host trainee and faculty perceptions is necessary to explore the reasons for different perceived impact of visiting North American residents and to understand the optimal environments for such visiting resident rotations.

Many host respondents had positive impressions of visiting residents. Similar to other studies, hosts perceived visiting resident rotations to improve the quality of their LMIC training programs[13,18]; provide an opportunity for cultural exchange[13,18,19]; allow for the bidirectional exchange of knowledge, skills, and

Table 4
Concordance between North American resident motivations and host surgeon perceived impact.

North American motivation or host perceived impact	NA[a]: average (SD)	Host: average (SD)	*p* value
Exposure to different case mix	4.57 (0.63)	4.22 (0.82)	0.0023[b]
Increase local access to surgical care	4.09 (1.06)	3.30 (1.05)	<0.0001[b]
Skill transfer: host ê resident	3.97 (0.89)	3.40 (0.99)	0.0007[b]
Knowledge transfer: host ê resident	3.89 (1.03)	3.72 (0.88)	0.2493
Reduce workload for local care team	3.81 (1.08)	3.52 (1.11)	0.2508
Positive impact on host institution	3.80 (1.13)	3.85 (1.10)	0.3121
Participation in high-volume center	3.56 (1.09)	4.00 (0.94)	0.0284
Skill transfer: NA resident ê host	3.55 (1.00)	3.78 (1.06)	0.1088
Knowledge transfer: NA resident ê host	3.50 (1.08)	4.04 (0.67)	0.0013[b]
Increase local surgical teaching capacity	3.39 (1.10)	3.36 (0.98)	0.9261
Mentor local trainees/surgeons	3.28 (1.06)	3.55 (1.02)	0.1413
Gaining operative independence	3.25 (1.18)	3.56 (1.07)	0.1256
Research collaboration	2.44 (1.25)	3.06 (1.25)	0.0013[b]

[a] NA: North American.
[b] Statistically significant. After adjustment for multiple corrections, threshold for significance is $p < 0.003$.

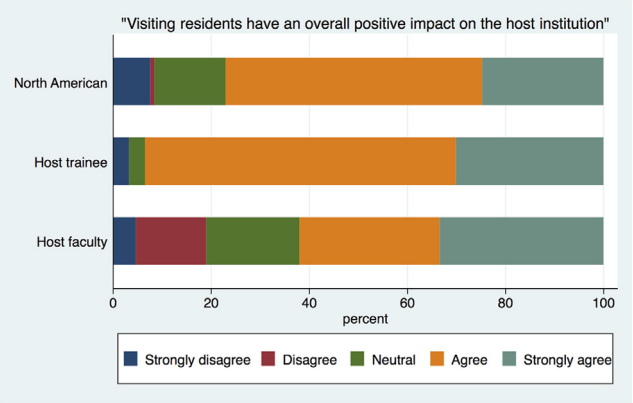

Fig. 3. Perceived impact of visiting North American residents on LMIC host institutions.

clinical experiences[10,13,20]; provide an opportunity for research partnerships[18,20,21]; and develop mentorship relationships.[18]

However, negative perceptions from host respondents were notable. At least one respondent perceived racial discrimination from visiting residents, and another respondent felt visiting residents were selfishly motivated. These perceptions echo concerns raised by others regarding the ethics of international volunteerism,[7,14,22,23] calling for such relationships to be mutually beneficial and culturally safe. Our study also identified concerns about competition between visiting and local trainees for surgical experiences and faculty attention. Successful partnerships require placing local training needs above visiting resident training needs,[24] and appropriate pre- and post-rotation orientation and reflection for visiting residents may mitigate this competition. Fewer than half of responding programs in this study have explicit learning objectives, which highlights another area for improvement. Other negative aspects of hosting visiting North American residents identified in this survey could be addressed by preparatory communication and orientation, including setting expectations regarding the pathology and resources encountered during the rotation, orienting visiting residents with respect to cultural and language differences, and working with host institutions to minimize the time and resource burden of hosting trainees from high income countries.[25] Additionally, while many North American programs have formal feedback opportunities for their teaching faculty to comment on resident performance during clinical rotations, less than one quarter seek similar feedback from their LMIC host partners. We recommend that North American programs solicit candid feedback from their host partners to identify areas of improvement in their rotation structure and offer an opportunity for host partners to express concerns about visiting residents. Finally, over two thirds of North American programs offered rotations that were two weeks in duration or shorter, which offers little time to establish rapport and develop relationships. Increasing the duration of rotations may further enhance the impact on both sides.

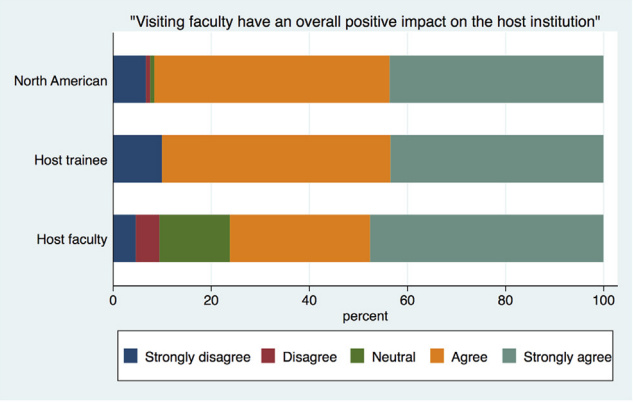

Fig. 4. Perceived impact of visiting North American faculty on LMIC host institutions.

Understanding host perceptions of visiting resident rotations is an important but under-reported component of determining characteristics of mutually beneficial orthopaedic partnerships. The Working Group on Ethics Guidelines for Global Health Training (WEIGHT) developed guidelines in 2010 for sending and hosting institutions, trainees, and sponsors, using published literature and expert opinion. These guidelines recognize the dearth of data regarding impact and challenges experienced by LMIC host institutions.[14] A systematic review in 2003 of global health experiences for trainees found that only four of 42 articles considered the impact of such rotations on host institutions,[9] and a recent systematic review at our institution of surgical global health trainee opportunities similarly found only four studies that addressed host perceptions – none of which pertained to the orthopaedic context.[26] This survey is an important step in establishing bidirectionality of such educational opportunities.

There are some limitations in our study. We were unable to calculate response rates to our surveys. In order to maximize responses, North American and host surveys were distributed through a variety of partnerships, and therefore the denominator of distribution is unknown. This method of distribution also likely contributed to duplicate responses, as respondents may have received the survey through multiple avenues. Additionally, to limit bias in responses, respondents were given the opportunity to remain anonymous, so we are unable to retroactively estimate response rate. However, the number of responses and diversity of demographics of respondents suggests that a diverse range of perspectives was captured in this study. A second limitation is that North American resident motivations were assessed, as opposed to North American residency program motivations. Motivations of the residency program leadership could differ from resident motivations for various reasons, including fostering a larger institutional partnership, filling a particular educational gap for either side of the partnership, or as a recruiting tool for future resident applicants. While this was beyond the scope of this study, additional work could provide insight to other factors influencing these academic partnerships. A third limitation is that the comparison of North American motivations and host perceived impact is not a direct comparison. While surveying both motivation and perceived impact from both North American and host respondents was considered, the burden of such an extensive survey was deemed to be prohibitive. We plan to perform follow-up semi-structured interviews with willing participants of all groups to better understand themes identified in this quantitative survey. Additionally, a prospective, paired analysis of motivations and impact as assessed by both visiting residents and host surgeons would allow for a more direct comparison and provide information on the characteristics of successful partnerships.

In summary, our study suggests that academic partnerships with LMIC training institutions can be more sensitive to the needs of the LMIC stakeholders. Table 7 summarizes recommendations developed from this study for academic partnerships between high-income countries and LMICs. Further exploration of host surgeon perceptions of the positive and negative impact of visiting orthopaedic residents is important to ensure that partnerships are sustainable and mutually beneficial.

Table 5
Themes and representative quotes of host surgeons' and trainees' perceived positive impact of visiting residents.

Theme	Representative quote(s)
Relationship development	- "Their relationships with our residents were very valuable" - "Mentorship" - "Vast insights into different cultures"
Improvement of host residency programs	- "By comparing our residencies we are able to upgrade ours to world class standards" - "They shared their learning experiences from North America, which made us confirm how terrible our current fear-based teaching system can be"
Exchange of knowledge, skills, clinical experiences, and resources	- "Exchange different criteria for managing orthopaedic and trauma cases" - "I got to know about how certain pathologies are treated in North America that we cannot treat here because of lack of resources or expertise" - "Exchange of learning materials with local residents"
Development of research partnerships	- "Helping with proposal development" - "Discussion on research issues" - "Research collaboration"
Improvement in patient care	- "Improved care and outcomes for the patients"
Integration of visiting residents into local team	- "The residents were happy with their involvement in all clinical works in the department"

Table 6
Themes and representative quotes of host surgeons' and trainees' perceived most negative impact of visiting residents.

Theme	Representative quote(s)
Selfishness of visiting residents and lack of reciprocity	- "We often get international residents who seem to be overwhelmed by what they see: the pathology, the welcome, etc.; but don't so much as answer back an email when they get back … the positives of such exchanges, in our experience, is one-way and extremely short-lived (lasts as long as the resident needs the host institution to provide for their interests)."
Racial discrimination	- "Racial discrimination"
Overwhelmed by unfamiliar pathology, limited resources	- "Sometimes they feel like they are completely lost with the scope of pathology and the differences" - "Not meeting their expectation due to lower quality of implants and equipment"
Competition for surgical experience and faculty teaching with host residents	- "Competition for cases with national residents" - "In one instance, a visiting resident took over a case from a local registrar who was too benign to oppose" - "My institution's faculty tend to show their skills and teach visiting residents while they show no interest in home residents"
Cultural and language barriers	- "The initial awkwardness of how to interact with one another before the ice breaks" - "Sometimes hard to communicate with some local residents" - "Language with some residents who aren't fluent"
Patient follow-up	- "Sometimes operated patients have complications that visiting residents aren't aware of, and we have to resolve them when they happen"
Time requirement to host visiting residents	- "We usually work with a tight schedule and in order to accommodate the visiting residents we need to add extra time (e.g., translation) during clinics resulting in clinics taking longer than usual, which negatively affects other activities"
Short duration of resident visits	- "If there is a negative maybe my advice will be to come more often and work with us" - "Not enough time together and not enough time to learn from each other"
Systems barriers	- "Institution is not very interested politically in hosting residents"

Table 7
Summary of recommendations for academic partnerships between North American orthopaedic residency programs and low- and middle-income country hosts.

Recommendation	Examples
Establish a reciprocal relationship	- Support observerships for LMIC surgeons and trainees at partner North American institutions - Tangibly support host institutions in response to hosting North American residents, through financial support, language services, etc.
Minimum rotation duration	- Encourage rotations of at least 4 weeks
Appropriate North American resident level	- Encourage rotations for senior North American residents to allow for improved information transfer
Selection of host institution	- Consider partnering with host institutions with local orthopaedic trainees
Pre- and post-rotation orientation and reflection	- Emphasize importance of placing local training needs above visiting resident training needs - Explicit learning objectives - Set expectations regarding pathology and resources - Orient to anticipated cultural and language differences - Communicate with host institution to minimize time and resource burden of hosting trainees
Formal bidirectional feedback	- Give and seek feedback from LMIC faculty, including visiting North American resident performance and efficacy of clinical rotation structure
Commitment to host experience and impact	- Support research to explore host perceptions and the impact on resident rotations on the local community - Incorporate host experience into future guidelines for academic partnerships

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The COACT Resident Rotation Study Group

John Dawson, Baylor College of Medicine Program, United States, John.Dawson@bcm.edu. Brian Davis, Baylor College of

Medicine Program, United States, Brian.Davis2@bcm.edu. Alan Daniels, Brown University Program, United States, alandanielsmd@gmail.com. Milton Little, Cedars-Sinai Medical Center Program, United States, Milton.Little@cshs.org. John Garlich, Cedars-Sinai Medical Center Program, United States, john.garlich@cshs.org. Chad Coles, Ross Leighton, Dalhousie University, Canada, coles@dal.ca, r.k.leighton@ns.sympatico.ca. Michael Maceroli, Emory University School of Medicine Program, United States, mmacerol@gmail.com. Sandra Hobson, Emory University School of Medicine Program, United States, sandralhobson@gmail.com. Chris Bray, Greenville Health System/University of South Carolina Program, United States, Christopher. Bray@prismahealth.org. Duretti Fufa, Hospital for Special Surgery/Cornell Medical Center Program, United States, FufaD@hss.edu. Sariah Khormaee, Hospital for Special Surgery/Cornell Medical Center Program, United States, sariah.khormaee@gmail.com. Brian Mullis, Roman M Natoli, Indiana University School of Medicine Program, United States, bmullis@iupui.edu, rnatoli@IUHealth.org. Babar Shafiq, Johns Hopkins University Program, United States, bshafiq2@jhmi.edu. Jimmy Mackenzie, Johns Hopkins University Program, United States, jmacken6@jhmi.edu. Danny Wongworawat, Lee Zuckerman, Loma Linda University Health Education Consortium Program, United States, dwongworawat@llu.edu, lzuckerman@llu.edu. Joshua Speirs, Loma Linda University Health Education Consortium Program, United States, Jspeirs@llu.edu. Charles F. Carr, Michael Mackechnie, Mary Hitchcock Memorial Hospital/DartmouthHitchcock Program, United States, charles.f.carr@hitchcock.org, michael.mackechnie@gmail.com. George Dyer, Melvin Makhni, Massachusetts General Hospital/Brigham and Women's Hospital/Harvard Medical School Program, United States, gdyer@mgh.harvard.edu, mmakhni@bwh.harvard.edu. Kiran Agarwal-Harding, Massachusetts General Hospital/Brigham and Women's Hospital/Harvard Medical School Program, United States, kiran.agarwalharding@gmail.com. Brandon Yuan, Mayo Clinic College of Medicine and Science (Rochester) Program, United States, Yuan.Brandon@mayo.edu. Matt Beal, McGaw Medical Center of Northwestern University Program, United States, mbeal@nm.org. Danielle Chun, McGaw Medical Center of Northwestern University Program, United States, Danielle-Chun@northwestern.edu. Andrew Furey, Memorial University of Newfoundland, Canada, afurey99@gmail.com. Brad Petrisor, McMaster University, Canada, petrisb@mcmaster.ca. Yongjung Kim, New York Presbyterian Hospital (Columbia Campus) Program, United States, yk2299@cumc.columbia.edu. Ken Egol, New York University School of Medicine/NYU Langone Orthopedic Hospital Program, United States, Kenneth.Egol@nyulangone.org. Christian Pean, Blake Schultz, New York University School of Medicine/NYU Langone Orthopedic Hospital Program, United States, christian.pean@nyulangone.org, blakeschultzmd@gmail.com. Darin Friess, Zach Working, Oregon Health & Science University Program, United States, friessd@ohsu.edu, workingz@ohsu.edu. Grant Sun, Oregon Health & Science University Program, United States, grant.s.sun@gmail.com. Henry Boateng, Penn State Milton S Hershey Medical Center Program, United States, hboateng@pennstatehealth.psu.edu. Michael Gardner, Stanford Health CareSponsored Stanford University Program, United States, michaelgardner@stanford.edu. Malcolm DeBaun, Blake Schultz, Stanford Health CareSponsored Stanford University Program, United States, mdebaun@stanford.edu, blakeschultzmd@gmail.com. Saquib Rehman, Eric Gokcen, J. Milo Sewards, Temple University Hospital Program, United States, Saqib.Rehman@tuhs.temple.edu, Eric.Gokcen@tuhs.temple.edu, jmilo.sewards@tuhs.temple.edu. Nicholas Bernthal, UCLA David Geffen School of Medicine/UCLA Medical Center Program, United States, NBernthal@mednet.ucla.edu. Zachary Burke, Alex Upfill Brown, UCLA David Geffen School of Medicine/UCLA Medical Center Program, United States, ZBurke@mednet.ucla.edu, AUpfillBrown@mednet.ucla.edu. Melissa Esparza, University of Arizona College of Medicine-Phoenix Program (Banner), United States, melissa.esparza@gmail.com. Peter O'Brien, University of British Columbia, Canada, peter.obrien@vch.ca. David Stockton, University of British Columbia, Canada, djstockton@telus.net. Kevin Neal, University of Florida College of Medicine Jacksonville Program, United States, Kevin.Neal@nemours.org. Nathan O'Hara, University of Maryland Program, United States, NO'Hara@som.umaryland.edu. Arun Hariharan, University of Maryland Program, United States, ahariharan@som.umaryland.edu. Peter Cole, Ann Van Heest, Patrick Horst, University of Minnesota Program, United States, peter.a.cole@healthpartners.com, vanhe003@umn.edu, horst.patrick@gmail.com. Brandon Kelly, University of Minnesota Program, United States, kell1401@umn.edu. Mauricio Kfuri, University of Missouri-Columbia Program, United States, kfurim@health.missouri.edu. Karl Lalonde, University of Ottawa, Canada, karllalonde@toh.ca. Jaimo Ahn, Samir Mehta, University of Pennsylvania Health System Program, United States, Jaimo.Ahn@pennmedicine.upenn.edu, Samir.Mehta@uphs.upenn.edu. Matt Winterton, Luke Lopas, University of Pennsylvania Health System Program, United States, mattwinterton@gmail.com, lalopas04@gmail.com. James Kellam, University of Texas Health Science Center at Houston Program, United States, james.f.kellam@uth.tmc.edu. Thomas Higgins, University of Utah Program, United States, thomas.higgins@hsc.utah.edu. Iain Elliot, University of Utah Program, United States, elliott.iain@gmail.com. Paul Whiting, University of Wisconsin Hospitals and Clinics Program, United States, Whiting@ortho.wisc.edu. Jordan T Shaw, Nathaniel M Wilson, University of Wisconsin Hospitals and Clinics Program, United States. William Obremskey, Vanderbilt University Medical Center Program, United States, william.obremskey@vumc.org. Cassandra A. Lee, Wake Forest University School of Medicine Program, United States, casslee@ucdavis.edu. Keith Kenter, Joseph Weistroffer, Western Michigan University Homer Stryker MD School of Medicine Program, United States, joseph.weistroffer@med.wmich.edu, keith.kenter@med.wmich.edu. Josh Veenstra, David Knowles, Western Michigan University Homer Stryker MD School of Medicine Program, United States david.knowles@med.wmich.edu, joshua.veenstra@med.wmich.edu Devin Conway, Yale-New Haven Medical Center Program, United States, Devin.conway@yale.edu. Aung Thein Htay, Yangon Orthopedic Hospital, Myanmar, dr.ath.ypa@gmail.com. Myat Thu Wynn, Yangon Orthopedic Hospital, Myanmar, myatthuwynn@icloud.com. Dr. Peter Smitham PhD, FRCS, FRACS, Royal Adelaide Hospital, Australia. Dr. Dino Aguilar, MD, Hospital Antonio Lenín Fonseca de Managua, Nicaragua. Amanda J McCoy MD, MPH, Tenwek Mission Hospital, Kenya. Kiprono Koech MD, Tenwek Mission Hospital, Kenya. Ian Orwa MD, Tenwek Mission Hospital, Kenya. Marvin Wekesa MD, Tenwek Mission Hospital, Kenya. Francis Mbugua MD, AIC Kijabe Hospital, Kenya. Daniel D Galat MD, AIC Kijabe Hospital, Kenya. John Mandela MD, AIC Kijabe Hospital, Kenya. David Jomo MD, AIC Kijabe Hospital, Kenya. James Kinyua, CURE International Hospital Kenya, Kenya. Mbonisi Malaba, CURE International Hospital Kenya, Kenya. Felix Kuguru, CURE International Hospital Kenya, Kenya. Fasto Yugusuk, CURE International Hospital Kenya, Kenya. Pierre Woolley, La Paix Hospital, Haiti, pmwoolley06@icloud.com. Marc-Alain Pean MD, La Paix Hospital, Haiti, marcalainpean@hotmail.com. Dr. Billy Haonga, MD, Dr. Edmund Eliezer, Muhimbili Orthopaedic Institute, Tanzania, bhaonga@gmail.com, ndalama@yahoo.com. Dr. Samuel Hailu, Tikur Anbessa Teaching Hospital, Ethiopia, samiethio@gmail.com. Dr. Fre Alemseged, Tikur Anbessa Teaching Hospital, Ethiopia, friyatom@gmail.com. Linda Chokotho, Beit Cure International Hospital (Malawi), Malawi, lindachokotho@gmail.com. Allman Tinoco, MD, Hospital San Juan de Dios, Colombia, allmantinocolukez@gmail.com. Bibek

Banskota, Hospital and Rehabilitation Centre for Disabled Children, Nepal. Scott Nelson, Hospital Adventiste d'Haiti, Haiti, scottnelsonmd@gmail.com. Francisco Alberto Hernandez Vargas, Hospital Escuela Antonio Lenin Fonseca, Nicaragua, franckohv@gmail.com.

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